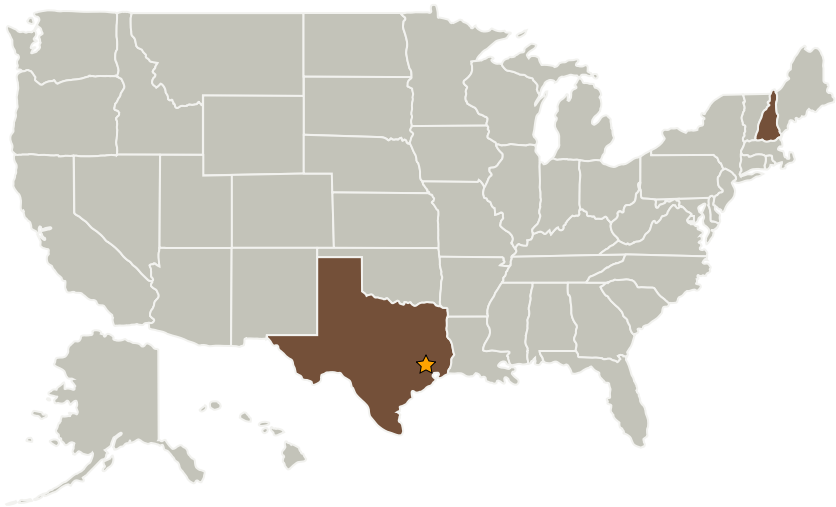
Thermal Management of Superconducting Electromagnets in VASIMR Thrusters, Phase II

Completed Technology Project (2004 - 2006)

Project Introduction

The Variable Specific Impulse Magnetoplasma Rocket (VASIMR) engine currently being developed at NASA Johnson is an attractive technology for minimizing transit time and crew harm during future space exploration missions. One of the critical challenges in developing a flight engine is thermal management of the high-temperature, superconducting electromagnets used to constrain and accelerate the plasma. The innovation of the proposed project is a high-capacity turbo-Brayton cryocooler for this application. The cryocooler has heritage in the space-qualified cryocooler that was developed by Creare and installed on the Hubble Space Telescope. Turbo-Brayton cryocoolers are lightweight, compact, efficient, and highly reliable. The technology scales well to high cooling capacities and is simple to integrate with multiple cooling objects; attributes that are particularly beneficial for VASIMR systems. In Phase I, we developed a preliminary design of the thermal management system, addressing key issues regarding the application of turbo-Brayton cooling technology to VASIMR engines. In Phase II, we plan to build and demonstrate a brassboard thermal management system. Phase II is justified by the feasibility demonstrated in Phase I, by the relevance of the project to a development effort at NASA, and by the importance of this technology to NASA's goal of space exploration.

Primary U.S. Work Locations and Key Partners



Thermal Management of Superconducting Electromagnets in VASIMR Thrusters, Phase II

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Thermal Management of Superconducting Electromagnets in VASIMR Thrusters, Phase II

Completed Technology Project (2004 - 2006)

Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Creare LLC	Supporting Organization	Industry	Hanover, New Hampshire

Primary U.S. Work Locations	
New Hampshire	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors